and that the instincts should be linked on to reason and the finer feelings so that the best in us may inhibit the worst.

The author makes a useful biological contribution to the problem of education, and has a wholesomely strong faith in the importance of "nurture," in the widest sense, in developing the individual's hereditary "nature." We would point out, however, that while Dr. Macnamara starts with Lloyd Morgan's clear-cut conception of instinct, he does not consistently adhere to it, and often uses the term instinctive very loosely; that he seems at times to exaggerate the separability of instinctive and intelligent faculties in children, for they seem to us to be very intimately blended; and that he gives glimpses of a quite untenable theory of energy overflowing or irradiating from one part of the nervous system to another so as to maintain a state of equipartition.

Dr. Macnamara was investigating and writing half a century ago, and we do not wonder that he has overlooked a number of typographical errors, such as "philogenetic," and "exasperating sway" (of women) instead of "way," but he should not have passed a sentence like this:—"The Hydromedusæ present two main forms, the non-sexual polyps or Hydra, and the sexual Medusæ, such as jelly-fish and sea anemones." Here there are at least three mistakes. Nor can we accept the statement that the male stickleback cements grass-stalks together with a layer of mucus exuded from the surface of his body.

INTRODUCTORY TREATISES ON MECHANICS.

(1) *An Introduction to Applied Mechanics.* By E. S. Andrews. Pp. ix + 316. (Cambridge: At the University Press, 1915.) Price 4*s.* 6*d.* net.

(2) *An Introduction to the Mechanics of Fluids.* By Prof. E. H. Barton. Pp. xiv + 249. (London: Longmans, Green and Co., 1915.) Price 6*s.* net.

(3) *Experimental Physics: A Text-book of Mechanics, Heat, Sound, and Light.* By Prof. H. A. Wilson. Pp. viii + 405. (Cambridge: At the University Press, 1915.) Price 10*s.* net.

WRITERS of mathematical text-books on mechanics and of so-called applied mechanics have still much to learn from one another. A too excessive abstract and logical development of the subject by the one tends to make the student lose the sense that it deals with real things; while evident striving for ultra-practicality by the other, and the looseness and inaccuracy of statement often combined with it, irritate him. On the one hand the ordinary student is bored, and on the other puzzled to death. For the difficulties which the industrious student of average ability experiences are more frequently than otherwise due to the fact of his having too logical and clear a mind, or rather perhaps to possessing a mind which requires logical presentment. To a certain extent the three books before us illustrate the above remarks in one direction or the other.

(1) That the first author would generally agree with them is apparent from his remarks in the preface that the older form of text-book was too much a kind of exercise ground for algebraic manipulation, and that many of the more modern give too much engineering application of the principles without sufficient explanation of those principles. And yet in reading through his attempt to strike the happy mean, one is constantly meeting statements which, though not quite wrong, are certainly not quite right. The following are a few samples. On p. 18 the principle of moments follows from Newton's first law of motion, because, since it does not change its state of rest, there is no tendency to rotate about any point. Two pages before it was given as a definition that this tendency is measured by the moment. It requires some thought on the part of the student to find that really he has been deceived into thinking that the principle is proved. On p. 17, "so long as we deal with forces in one plane, moments are scalar quantities." The student is brought to a stop with the query why the scalarity of the moment of a force should depend on the nature of other forces with which it has nothing to do. (Owing to an oversight also here the example given does not agree with the direction of the forces in the diagram.) On p. 40 "we may point out that when in ordinary parlance we speak of power we really mean energy." On p. 139 "stress may be defined as the force between the molecules of a body brought into play by the strain." On p. 124 "inertia is the property of a body which resists a change of motion" recalls Maxwell's classical illustration of this statement by a cup of tea resisting being sweetened by the sugar put into it. It is difficult to see what object is gained by the elaborate drawing of a steamboat on p. 45, or of a traction engine and track on p. 127.

In spite of these defects, the book can be recommended for use by engineering students. The substance is well chosen and the treatment adequate. A student who has mastered it should have a good working knowledge of the dynamical principles underlying every engineer's work. The first eight chapters are an introduction to

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dynamical principles. Chapters ix.–xii. deal with stresses and strains in joints, frames, and girders; chaps. xiii.–xv. with centres of gravity, friction, and curved paths; and the last with mechanisms.

(2) This introduction to the study of fluids is intended "for candidates for entrance scholarships and other examinations, for naval and military preparation, for those technical students taking the Board of Education lower examination in theoretical mechanics (fluids), or any of a similar character held by the various provincial educational unions." For these purposes it would seem to be an adequate and sound presentation of the subject. In addition, it will also serve to give the student a sound knowledge of the subject—a result almost as important. Part i., on the mechanical basis of the subject, might possibly have been omitted with advantage as the majority of students would come to the study of fluids with a preliminary knowledge of dynamics from other sources. The succeeding parts deal with liquids at rest, in motion, properties of gases, and finally with applications. This last contains a valuable addition to the usual list of old friends, and deals with a number of recent inventions of special interest as illustrating principles. The book affords an excellent example of the combination of logical development and exactness of ideas with the stimulating effect aroused by dealing with real problems.

(3) The scope of this book is best shown by the following extracts from the preface. "This book is intended as a text-book for use in connection with a course of experimental lectures." "The aim of the writer should be to present fundamental principles clearly and accurately." "I have endeavoured to leave out everything not of fundamental importance." "The kind of text-book which contains a little about everything does more harm than good." It is thus seen how much the intention of the author differs from that of the generality of writers of text-books for first year and elementary students. The result is a very clear and excellent introduction to the subject of mechanics, properties of matter, heat, sound, and light, suitable to the needs of university students in their first year and taking curricula for pure science, medicine, or applied science. It is a book for which examinations should be suitable, laying sound foundations for future developments in greater or less degree as may be required for the more specialised curricula of the second and third years. Where an effort has been made to circumscribe the field, differences of opinion may arise as to whether it may not have been carried too far, but each individual teacher can always remedy this in the case of his own students. For example, it may be doubtful if it is desirable to leave out all consideration of radiation or whether more application of principles to explain common and everyday experiences might not have been given with advantage—in spite of the fact that to the author such things may be hackneyed.

No sets of examples for exercise are given. This is a disadvantage for private students. Any competent teacher giving a course of experimental lectures will have his own selection. To such the book can be confidently recommended. It has the good paper, printing, and clearness expected from the Pitt Press. It is curious to see in a book printed in an English University a statement that thermometers may be standardised by sending them to the Bureau of Standards at Washington, U.S.A., or similar institutions in other countries. In another edition the explanation of the total reflection of the ordinary ray in a Nicol's prism should be amended. Also the melting-point of sodium thiosulphate ("hypo") is not 9·9° C.

OUR BOOKSHELF.

A Course in Invertebrate Zoology. A Guide to the Dissection and Comparative Study of Invertebrate Animals. By Prof. H. S. Pratt. Revised edition. Pp. xii+228. (Boston and London: Ginn and Co., 1915.) Price 6*s*.

THIS book is intended as a guide to the study of each of the larger groups of invertebrates. About forty animals are considered in the space of 196 pages, consequently the descriptions of many of them—clear so far as they go, and accurate, the lapses being few and of little moment—are brief, though several, *e.g.* the squid, are more fully treated. The chapters deal respectively with the arthropoda, annelida, flat worms, polyzoa, mollusca, tunicates, echinoderms, Cnidaria, sponges, and protozoa. The revised edition contains instructions for the examination of six types not included in the first edition, namely, a fly, spider, oyster, sea-cucumber, Gonionemus, and a sea-anemone. In the account of the fly attention is directed to the "antennæ, with their pinnate terminal portion" (the portion referred to—the arista—is, however, not terminal but dorsal), but the palps are not mentioned, and no attempt is made to elucidate the structure of the proboscis.

In the classification given in the appendix the sponges are classed with the Cnidaria as cœlenterates—implying a relationship which modern work has shown to be untenable; another obsolete feature is the retention of the "phylum" Vermes to include a heterogeneous assemblage of animals —flat and round worms, rotifers, polyzoa, brachiopods, Phoronis, Chætognatha and Sipunculoidea (the annelids are placed in a separate phylum).

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